Patent claims

We Claim:

1. A DNA sequence coding for a protein having the enzymatic activity of an amylosucrase, selected from the group consisting of
   (a) DNA sequences coding for a protein having the amino acid sequence depicted under Seq ID No. 1;
   (b) the DNA sequence exhibiting the coding region depicted under Seq ID No. 1;
   (c) DNA sequences hybridizing to any of the sequences of (a) or (b); and
   (d) DNA sequences which are degenerate due to the genetic code in comparison to the sequences mentioned in (a), (b) or (c).

2. A DNA sequence coding for a protein having the enzymatic activity of an amylosucrase, obtainable by a process comprising the following steps:
   (a) preparing a genomic or a cDNA library on the basis of the genomic DNA or the mRNA of cells of an organism;
   (b) transforming a suitable host with the library constructed according to (a);
   (c) subjecting the transformed cells to iodine vapor;
   (d) identifying the cells that are stained blue;
   (e) isolating and cultivating the cells identified in step (d); and
   (f) isolating the genomic DNA insert or the cDNA insert from the transformed cells.

3. A recombinant DNA molecule containing a DNA sequence according to claim 1 or 2.

4. The recombinant DNA molecule according to claim 3, in which the DNA sequence coding for a protein having the enzymatic activity of an amylosucrase is linked with DNA

sequences allowing transcription in procaryotic or eucaryotic cells.

5. The plasmid pNB2, deposited as DSM 9196.

6. A microorganism, containing a recombinant DNA molecule according to any of claims 3 to 5.

7. A fungus, containing a recombinant DNA molecule according to any of claims 3 to 5.

8. A protein having the enzymatic activity of an amylosucrase which is coded for by a DNA sequence of claim 1 or 2.

9. A process for the production of a protein according to claim 8, comprising culturing a microorganism according to claim 6 or a fungus according to claim 7 in a suitable culture medium.

10. A process for the production of plants capable of synthesizing linear α-1,4 glucans, characterized in that a DNA sequence according to claim 1 or 2 linked to DNA sequences ensuring expression of said DNA sequence is introduced into plant cells and whole plants are regenerated from said plant cells.

11. The process according to claim 10, comprising the following process steps:

(a) producing an expression cassette having the following partial sequences:

(i) a promoter being active in plants and ensuring formation of an RNA in the respective target tissue or target cells;

(ii) at least one DNA sequence as indicated in claim 10 which codes for a protein having the

enzymatic activity of an amylosucrase and which is fused to the promoter in sense orientation;

(iii) a signal being functional in plants for the transcription termination and polyadenylation of an RNA molecule;

(b) transferring the expression cassette into plant cells; and

(c) regenerating intact whole plants from the transformed plant cells.

12. A process for the production of microorganisms capable of synthesizing linear α-1,4 glucans in which a DNA sequence according to claim 1 or 2 is introduced into the microorganism and is expressed.

13. A process according to claim 12, comprising the following process steps:

(a) producing an expression cassette having the following partial sequences:

(i) a promoter being active in the selected microorganism and ensuring transcription of the DNA sequence downstream thereof;

(ii) a DNA sequence coding for an amylosucrase and being fused to the promoter in sense orientation;

(iii) a transcription termination signal being functional in microorganisms; and

(b) transforming an appropriate microorganism with the expression cassette constructed in step (a).

14. Process for the prodution of fungal cells capable of synthesizing linear α-1,4 glucans in which a DNA

sequence according to claim 1 or 2 is introduced into fungal cells and is expressed.

15. Process according to claim 14, comprising the following steps:

(a) producing an expression cassette having the following partial sequences:
(i) a promoter being active in cells of the selected fungus and ensuring transcription of the DNA sequence downstream thereof,
(ii) a DNA sequence coding for an amylosucrase and being fused to said promoter in sense orientation,
(iii) a transcription termination signal being functional in said fungal cells; and

(b) transforming fungal cells with the expression cassette constructed in step (a).

16. Transgenic plant cells and plants containing a DNA sequence according to claim 1 or 2 in combination with DNA sequences allowing expression of the DNA sequence in plant cells.

17. The plant according to claim 16, characterized in that it is a crop plant.

18. The plant according to claim 16 or 17, characterized in that it is a maize, rice, wheat, barley, sugar beet, sugar cane, tobacco, tomato or potato plant.

19. Use of a DNA sequence according to claim 1 or 2 or of a probe molecule derived thereof for the isolation of homologous DNA or RNA sequences.

20. Use of proteins according to claim 8 for the production of linear α-1,4 glucans.

21. Use of proteins according to claim 8 for the production of fructose.